802.3dj D3.2 Comment Resolution Optical Topics

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Introduction

- This slide package was assembled by the 802.3dj editorial team to provide background and detailed resolutions to aid in comment resolution.
- Specifically, these slides are for the various optical-track comments.

Transmitter functional test

Comments 124, 20, 125, 129, 201

TFT
Comment 20 and 129

180.9.8 Transmitter functional test (TFT)

The transmitter functional test uses a functional receiver (FnRx) defined in 180.9.8.1 to measure a transmitter functional symbol error histogram defined in 180.9.8.2. A block diagram showing the FnRx is shown in Figure 180–12. The transmitter under test is connected to the FnRx by a test fiber, which meets the requirements in 180.9.6.2. Full compliance with 180.9.6.2 requires the test fiber to provide back reflection with polarization state resulting in the greatest RIN. Other test fibers, including patch cords, may be used for additional tests.

For those cases where there is an xAUI-n chip-to-chip (C2C) or chip-to-module (C2M) interface (see Table 180–1 through Table 180–4), the clock for the transmitter output is recovered from the xAUI-n input signal. The pattern of the xAUI-n input signal may be PRBS31Q, scrambled idle, or a valid xBASE-R signal.

The transmitter under test is configured with precoding set appropriately for the FnRx being used in the test. The appropriate precoding state may be communicated via the ILT function or by other means.

~~The transmitter block error histograms are measured using the method described in 174A.9.3.~~

A probable failure is indicated by either of the following:
— exceeding the transmitter functional symbol error histogram mask defined in Table 180–17
— a value greater than 0 in counter test_block_error_bin_i_k (see 174A.9.2), for k greater than 8

TFT
Comment 124

180.9.8.1 FnRx definition

The FnRx is a variable optical attenuator (VOA) followed by an optical receiver (ORx) that complies with the characteristics in Table 180–8. The VOA and test fiber approximate the compliance channel as given in Table 180–15 with the exception that the channel loss is not minimum. The VOA level is set to the value given by Equation (180–15).

NOTE 1—The intent of the first and second terms of Equation (180–15) is to calibrate differences in test fibers and optical receivers, respectively, to reduce variability across different test conditions.

VOA_level = Test_fiber_correction + ORx_~~TECQ_~~correction~~ – Test_margin~~ (180–15)

where:

Test_fiber_correction is ~~given by Equation (180–16), and is~~ the difference between the power budget used to determine the transmitter under test OMAouter (min) and the best estimate of the test fiber power budget, and is given by Equation (180–16)

ORx_~~TECQ_~~correction is the difference between receiver sensitivity (max) as given in Table 180–8 ~~and ORx receiver sensitivity~~, and best estimate of ORx receiver sensitivity at TFT operating BER, both at transmitter under test TECQ, and is given by Equation (180–19)

~~Test_margin is the additional ORx_OMA to improve SNR of the transmitter functional test. It is equal to 1.5 dB. The ORx operating BER target assuming random errors is changed to 2.4 × 10−5. The transmitter functional symbol error mask (see Table 180–17) is calculated using this BER target.~~

TFT
Comment 124

Test_fiber_correction = Tx_DUT_power_budget – Test_fiber_power_budget (180–16)

where:
Tx_DUT_power_budget is the transmitter under test power budget as specified in Table 180–9, except that the TDECQ value measured over the test fiber is used instead of the max TDECQ value~~.~~ ~~It~~ , and is given by Equation (180–17)

Test_fiber_power_budget is the power budget of the test fiber using the best estimates of the test fiber channel insertion loss, MPI and DGD penalties, and TDECQ of the DUT over the test fiber, and is given by Equation (180–18)

Tx_DUT_power_budget = Channel_insertion_loss + MPI_and_DGD_penalties_allocation + max(DUT_TECQ, DUT_TDECQ) (180–17)

where:
Channel_insertion_loss is the “Channel insertion loss” as given in Table 180–9
MPI_and_DGD_penalties_allocation is the allocation for MPI and DGD penalties as given in Table 180–9
DUT_TECQ is the measured TECQ for the transmitter under test
DUT_TDECQ is the measured TDECQ for the transmitter under test

Test_fiber_power_budget = Test_fiber_loss + Test_fiber_MPI_and_DGD_penalties + Test_fiber_DUT_TDECQ (180–18)

where:
Test_fiber_loss is the best estimate of the actual channel insertion loss of the test fiber
Test_fiber_MPI_and_DGD_penalties is the best estimate of the actual MPI and DGD penalties of the test fiber
Test_fiber_DUT_TDECQ is the best estimate of the transmitter under test actual TDECQ value over the test fiber. An example estimate is the measured DUT_TECQ value plus the best estimate of the actual transmitter under test CD penalty over the test fiber

TFT
Comment 124

ORx_~~TECQ –~~correction = RxS_OMA_max_at_DUT_TECQ – ORx_RxS_OMA_at_DUT_TECQ – Test_margin (180–19)

where:

RxS_OMA_max_at_DUT_TECQ is the receiver sensitivity OMAouter (max) spec at the measured TECQ of the transmitter under test

ORx_RxS_OMA_at_DUT_TECQ is the ORx receiver sensitivity OMAouter at the measured TECQ of the transmitter under test

Test_margin is the additional ORx_OMA to improve SNR of the transmitter functional test. It is equal to 1.5 dB. The ORx operating BER target assuming random errors is changed to 2.4 × 10–5. The transmitter functional symbol error mask (see Table 180–17) is calculated using this BER target.

NOTE 2—The correction factor given by ORx_~~TECQ –~~correction might be moderately pessimistic depending upon the ~~relative~~ characteristics of the device used as the reference receiver and the transmitter under test. A failure of the TFT accurately identifies a transmitter that is not generally interoperable. However, the test might ~~falsely~~ fail a generally interoperable transmitter, which might be addressed by a moderate increase in transmitter OMAouter to pass TFT.

Rx LRS signal
Comment 25

Rx LRS signal
Comment 25

Table 180–18—LRS conformance test signal exceptions to transmit characteristics

Parameter	Value	Unit
TECQ (max)	1.8	dB
TECQ (min)	1.4	dB
Overshoot and undershoot (max)	10	%
Extinction ratio (max)	5.5	dB
Extinction ratio (min)	4.5	dB
Transition time (max)	6.5	ps
Transition time (max)	4.5	ps
ORL tolerance (min)	15.5	dB
Average launch power of each ~~non-test signal~~ aggressor lane (max)	-15	dBm